IN THE CLAIMS:

All of the pending claims 1 through 23 are presented below. This listing of claims will replace all prior versions and listings of claims in the application. Please enter these claims as amended.

Please amend claims 1-23 as set forth below.

1. (Currently Amended) A method for thermally converting one or more metal halide reactants in a thermodynamically stable high temperature gaseous stream to a desired end product in the form of a gas or ultrafine solid particles, comprising [the following steps]:
introducing a metal halide reactant stream at one axial end of a reaction chamber;
introducing a reducing gas to the gaseous stream prior to or at the time the metal halide reaches a selected reaction temperature;
the reactor chamber having a predetermined length sufficient to effect heating of the gaseous stream to the selected reaction temperature at which a desired end product is available as a thermodynamically unstable reaction product at a location adjacent [the] an outlet end of the reactor chamber;
rapidly expanding the reactant stream to rapidly cool the gaseous stream by converting thermal energy to kinetic energy as a result of adiabatic and isentropic expansion as the reaction stream expands;
adding additional reducing gas to the reactant stream after it has reacted with the initial reducing gas to minimize back reactions, thereby retaining the desired end product within the flowing gaseous stream; and
collecting the desired end product.

2. (Currently Amended) The method of claim 1, wherein introducing a reducing gas to the gaseous stream further comprises introducing [the reducing gas is] hydrogen to the gaseous stream.

3. (Currently Amended) The method of claim 1, [wherein the rapid heating step is accomplished by] further comprising introducing a stream of plasma arc gas to a plasma torch at the one axial end of the reactor chamber to produce a plasma within the reaction chamber which extends toward [its remaining] a second axial end and heating the gaseous stream with the plasma to the selected reaction temperature.

4. (Currently Amended) The method of claim 3, wherein [the step of] rapidly expanding the reactant stream to rapidly [cooling] cool the desired end product [is accomplished by use of] includes flowing the reactant stream through a restrictive convergent-divergent nozzle.

5. (Currently Amended) The method of claim 2, wherein collecting the desired end product [is] includes collecting titanium metal and, wherein introducing a metal halide [the] reactant [is] includes introducing titanium tetrachloride.

6. (Currently Amended) The method of claim 2, wherein collecting the desired end product [is] includes collecting vanadium metal and, wherein introducing a metal halide [the] reactant [is] includes introducing vanadium tetrachloride.

7. (Currently Amended) The method of claim 2, wherein collecting the desired end product is includes collecting aluminum metal and, wherein introducing a metal halide the reactant is aluminum chloride.

8. (Currently Amended) The method of claim 2, wherein collecting the desired end product [is] includes collecting a titanium-vanadium alloy and, wherein introducing a metal halide [the reactants are] reactant includes introducing a mixture of titanium tetrachloride and vanadium tetrachloride.

9. (Currently Amended) The method of claim 2, wherein collecting the desired end

product [is] includes collecting a titanium-boron composite ceramic powder and, wherein introducing a metal halide [the reactants are] reactant includes introducing titanium tetrachloride and boron trichloride.

10. (Currently Amended) The method of claim 2, wherein collecting the desired end product [is] includes collecting uranium and, wherein introducing a metal halide [the] reactant [is] includes introducing uranium hexafluoride.

11. (Currently Amended) The method of claim 4, wherein collecting the desired end product [is] includes collecting uranium, wherein introducing a metal halide [the] reactant [is] includes introducing uranium hexafluoride, and wherein introducing a [the] reducing gas [is] includes introducing hydrogen.

12. (Currently Amended) The method of claim 11, wherein the [first introduction of reducing gas to the gaseous stream] introducing hydrogen is effected prior to or at the time of the [injection of the] introducing uranium hexafluoride.

13. (Currently Amended) The method of claim 12, wherein [the step of] adding additional reducing gas to the reactant stream is effected immediately before [the] a throat of the nozzle throat, at the throat of the nozzle [throat], or immediately after the throat of the nozzle [throat].

14. (Currently Amended) A method for thermal conversion of one or more metal halide reactants in a thermodynamically stable high temperature gaseous stream to a desired end product in the form of a gas or ultrafine solid particles, comprising [the following steps]:

introducing a stream of plasma arc gas between the electrodes of a plasma torch including at least one pair of electrodes positioned at [the] an inlet end of an axial reactor chamber, the stream of plasma arc gas being introduced at a selected plasma gas flow while the

electrodes are subjected to a selected plasma input power level to produce a plasma within the reactor chamber and extending toward [its] an outlet end thereof;

thoroughly mixing an incoming reactant stream into the plasma by injecting at least one metal halide reactant into the reactor chamber at or adjacent to [its] the inlet end thereof at a selected injection angle and at a selected reactant input rate to progressively effect heat transfer between the plasma and the resulting gaseous stream as it flows axially toward the outlet end of the reactor chamber;

introducing a reducing gas to the plasma arc gas stream prior to or at the time the metal halide reactant stream is added;

the length of the reactor chamber being sufficient to effect heating of the gaseous stream to a selected equilibrium temperature at which a desired end product is available as a thermodynamically unstable reaction product within the gaseous stream at a location adjacent to the outlet end of the reactor chamber;

directing the gaseous stream through a coaxial convergent-divergent nozzle positioned in the outlet end of the reactor chamber to rapidly cool the gaseous stream by converting thermal energy to kinetic energy as a result of adiabatic and isentropic expansion as it flows axially through the nozzle, the nozzle having a converging section and a diverging section respectively leading to and from a restrictive open throat;

adding additional reducing gas to the reactant stream immediately prior to the throat of the nozzle, at the throat of the nozzle or immediately after the throat of the nozzle to minimize back reactions and retain the desired end product in the flowing gaseous stream;

cooling the gaseous stream exiting the nozzle by reducing its velocity while removing heat energy at a rate sufficient to prevent increases in its kinetic temperature; and

separating desired end products from the gases remaining in the cooled gaseous stream.

15. (Currently Amended) The method of claim 14, further comprising [the following step:]

accelerating the gaseous stream rapidly into the nozzle throat while maintaining laminar flow by passage of the gaseous stream through [a] the converging section of the nozzle having a high aspect ratio.

16. (Currently Amended) The method of claim 14, further comprising [the following step:]

controlling the residence time and reaction pressure of the gaseous stream in the reactor chamber by selection of the size of the restrictive open throat within the nozzle.

17. (Currently Amended) The method of claim 14, wherein introducing a [the] reducing gas [is] includes introducing hydrogen.

18. (Currently Amended) The method of claim 17, wherein separating desired end products from the gases remaining in the cooled gaseous stream includes separating [the desired end product is] uranium from the cooled gaseous stream and, wherein injecting at least one metal halide reactant into the reactor chamber includes injecting [the reactant is] uranium hexafluoride.

19. (Currently Amended) The method of claim 17, wherein separating desired end products from the gases remaining in the cooled gaseous stream includes separating [the desired end product is] titanium from the cooled gaseous stream and, wherein injecting at least one metal halide reactant into the reactor chamber includes injecting [the reactant is] titanium hexafluoride.

20. (Currently Amended) A method for producing titanium, comprising [the following steps]:

decomposing a titanium compound by introducing two or more reactant streams of titanium compound and one or more other reactants into the same point in a hot plasma in a reaction chamber, such that the reactants react generally at a common point; and

rapidly expanding the reactant stream to effect cooling of the reactant stream as the reactant

stream moves down the reactant chamber.

21. (Currently Amended) The method of claim 20, wherein introducing one or more [the other reactant is] other reactants includes introducing hydrogen and, wherein decomposing a [the] titanium compound [is] includes decomposing titanium tetrachloride.

22. (Currently Amended) The method of claim 21, [wherein] further comprising introducing additional hydrogen [is added] to the reactant stream after [it] the reactant stream begins to expand to minimize back reactions and retain the desired end product in the reactant stream.

23. (Currently Amended) A method for thermally converting one or more reactants in a thermodynamically stable high temperature gaseous stream to a desired end product in the form of a gas or ultrafine solid particles, comprising [the following steps]:

introducing a reactant stream at one axial end of a reaction chamber;

the reactor chamber having a predetermined length sufficient to effect heating of the gaseous stream to a selected reaction temperature at which a desired end product is available as a thermodynamically unstable reaction product at a location adjacent [the] an outlet end of the reactor chamber;

passing the gaseous stream through a virtual convergent-divergent nozzle formed by directing one or more streams of particles, droplets, liquid or gas into the main flow stream of the reaction chamber to cause the main gaseous stream to flow as if a real convergent-divergent nozzle were present, to rapidly cool the gaseous stream by converting thermal energy to kinetic energy as a result of adiabatic and isentropic expansion as the reaction stream expands; and

collecting the desired end product.